brain lesions which surely look as a group irreparable. Perhaps, however, there are in man also certain cases of encephalitis which reverse themselves, and which in their course are taxed with being "functional" diseases and furnish "functional" symptoms during and after tissue repair.

We wish to thank Drs. Mason, Shattuck, Sears, and Coolidge for the use of their clinical records, and Drs. Brinckerhoff, Thompson, and Wolbach for the anatomical data in their autopsies. Drs. Councilman and Mallory have looked over the histopathological work, and Dr. W. N. Bullard has interested himself in its neurological aspect. The work was done under the Bullard Gift to the pathological department of the Harvard Medical School for 1904.

PRIMARY SPLENOMEGALY—GAUCHER TYPE.*

REPORT ON ONE OF FOUR CASES OCCURRING IN A SINGLE GENERATION OF ONE FAMILY.

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Clinical (Dr. N. E. Brill). Under the caption of primary splenomegaly have been heaped together indiscriminately a large variety of non-leukæmic enlargements of the spleen developing with or without anæmia. Osler, in an attempt to establish order out of chaos, suggested calling the cases of enlarged spleen associated with an anæmia of the chlorotic type and with hemorrhages, but unaccompanied by a leukocytosis, splenic anæmia, adopting as the cognomen the term first used by Griesinger for the splenic variety of Hodgkin's disease. He insists that these cases in their evolution present a terminal stage characterized by secondary cirrhosis of the liver associated with jaundice and ascites, which Banti described as constituting a disease *sui generis*, and which cases have been known as those of Banti's disease. But even with Osler's limitation, under the term of splenic anæmia, there have been associated diverse splenic enlargements, differing both in their clinical and pathological conditions, such as the cases described by Sippy,[1] Osler,[2] Rolleston,[3] Taylor,[4] Gilbert and Fournier,[5] Stengel,[6] and others. Much more work will have to be done, many more clinical and pathological investigations will have to be made, before a satisfactory classification of the varieties of types of so-called splenic anæmia can be agreed upon.

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* An abstract of this report was presented at a meeting of the New York Pathological Society on December 14, 1904.

The writer insists that the type of splenomegaly first described in 1882 by Gaucher[7] as "Splenomegalie Primitive—Primary Epithelioma of the Speen," and after him by Picou and Raymond,[8] Collier,[9] and Bovaird,[10] ought not to be included in the category of splenic anæmia, because its pathology is unique and typical and the clinical picture so distinctive that it can be recognized during life. It was from the clinical picture presented by the patients whose histories I reported in THE AMERICAN JOURNAL OF THE MEDICAL SCIENCES for April, 1901, that I was able to predict that my cases* belonged only to the class described by Gaucher as splenomegalie primitive. Indeed, one of the distinctive features of this class, which alone might separate it from all the cases belonging to the category of splenic anæmia is the enormous increase in the size of the liver, which almost equals the colossal size of the spleen.

For the benefit of those who have not access to the original article, a *résumé* of the clinical data of the case which forms the topic of this report is herewith given; for full details the reader is referred to the original publication. It is the first male case ever reported in literature:

Maximilian R., born in 1870, had suffered from the common infectious diseases of childhood, but never had malaria, rheumatism, or tuberculosis. He had not been rachitic and never contracted gonorrhœa or syphilis. After his ninth year he was a sturdy, muscular, healthy chap, and never was ill outside of an occasional attack of bronchitis. The only features of an abnormal nature which the patient himself observed was a tendency to sweat easily, the frequent presence of sudamina, even in winter, and a persistent patch of erythematous papules which extended from the malar prominence of one side across the skin covering the nasal bone to the same prominence on the other side, most intense, however, on the bridge of the nose. The latter developed about his fourteenth year, and, notwithstanding treatment by skin specialists, was persistent. In 1885, when he came under my observation, this patch was prominent. No signs of splenic enlargement appeared until 1889. Patient felt in perfect health all the years since his ninth. There were no pains in the splenic region at any time up to the date of the detection of an enlarged spleen. Since 1889, after an apparent initial slight reduction in the size of the spleen, there had been a steady, slow, progressive increase in size of that organ, with occasional attacks of epistaxis. In 1899 the first absolute signs of liver enlargement became demonstrable, and about this time was noticed a peculiar hard, pale, ochre-colored, wedge-shaped infiltration of the sclerotic of the nasal side of each eye, the base being limited by the cornea, the apex extending toward the nasal angle, thus differing from the ordinary pinguecula.

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* The disease has since been discovered by me in another sister, who constitutes the fourth member of the one generation of the family thus afflicted.

While feeling in perfect health the patient was losing weight very slowly but progressively. Between 1899 and 1900 the skin of the face, neck, and hands began to assume a dusky, light yellowish-brown tint. Wherever the skin was not exposed to the light and air it was perfectly normal in color. There was an entire absence of jaundice; examination of the blood and urine showed no bile.

Frequent blood examinations were made, blood counts dating from 1893, and showing a normal red and white count, and normal proportions of polynuclear neutrophiles, small and large mononuclears and eosinophiles. The hæmoglobin up to 1900 was never lower than 80 per cent. by Gowers' instrument.

The progress of the disease became rapid from August, 1900, when the patient was seized by an attack of acute colitis, starting with a chill, and followed by hyperpyrexia and diarrhœa, the movements finally becoming bloody and composed then of mucus and sanguineous fluid. Immediately after convalescence hemorrhagic furuncles appeared on the legs, thighs, trunk, arms, and forehead, leaving behind them, when healed, permanent pigmented spots at the site of each furuncle. Excepting these spots and the peculiar change in color of the face and hands, there was no pigmentation anywhere of the skin or of the mucous membranes accessible to inspection. Later in the year the first signs of petechiæ appeared, three on the thorax.

From January, 1902, to May, 1902, there was very little if any change in the condition of the patient. In May he began to complain of pain in the lower end of the left tibia. Physical examination at the seat of pain revealed nothing, there being no swelling, redness, or tenderness.

On June 6, 1902, he was seized by an attack of malarial infection, with the usual signs of the tertian type; plasmodia were found in the blood. A course of quinine dissipated the organisms. Epistaxis, which had not been frequent in the past, now became more so, and the blood examinations revealed a steady decrease in hæmoglobin to 45 per cent., and a slight increase in leukocytes, 8240; the red cells being diminished, 3,420,000. The red cells showed a few normoblasts (August 1, 1902). He complained less of pain in the lower part of the tibia; occasionally this pain disappeared entirely, even for a month at a time. During the attack of malarial infection there was no demonstrable increase in the size of the spleen.

In September the patient was so well that he again attended actively to business. He remained in a condition of relative well-being throughout the rest of the year and the first half of the following year, 1903. During these nine months he had but four attacks of epistaxis. In April, 1903, he began to complain again of the pain in the neighborhood of the ankle and also about the left knee. There were no local signs of swelling, etc., and no indications of a hæmarthrosis. A blood examination at this date revealed the following: red cells, 4,400,000; white, 5240; hæmoglobin, 55 per cent.; polynuclear neutrophiles, 65 per cent.; small mononuclear, 26.5 per cent.; large mononuclear, 6.5 per cent.; transitional forms, 1 per cent.; eosinophiles, 0.5 per cent.

In June, 1903, in the warm spell, his sudamina became pronounced, a few miliaria becoming hemorrhagic; the erythematous patch on the nose became more livid. The pain in the left knee and ankle, however, disappeared. The heated term weakened him considerably, and he left town, spending the next three months in the mountains, where he felt very well.

On his return examination revealed a slight increase in the size of the spleen, its anterior border extending 3 cm. beyond the middle line; the upper border (dulness) was at the fifth rib in the midaxillary line; the posterior border could be felt in a line with the angle of the scapula about 4 cm. from the lumbar spines, and became lost to the touch behind the iliac crest. The liver had relatively increased more in size. Liver flatness was elicited at the fourth rib, lower border palpable 4 cm. below the level of the umbilicus, extending below the iliac crest in the midaxillary and postaxillary lines. His chest and abdomen were more bulging than ever.

September 27, 1903. Red cells, 4,200,000; white cells, 6200; polynuclears, 70 per cent.; small lymphocytes, 22 per cent.; large lymphocytes and transitionals, 7 per cent.; eosinophiles, 0.5 per cent.

Heart. Loud systolic murmur at apex and over pulmonary area; upper border of cardiac dulness at lower border of second rib; right border at right sternal line; apex in third interspace.

November 17th. A moderately severe epistaxis.

27th. A few petechiæ are noted on the dorsum of each hand; none on conjunctivæ. Hæmoglobin, 50 per cent. Patient has a ravenous appetite. Again complains of pain in left knee and ankle. He, however, has been taking long walks daily. No demonstrable increase in size of spleen or liver.

January 6, 1904. First appearance of ecchymosis—one ecchymotic spot on left lower leg near the end of the fibula and one on dorsum of left foot, each about 2 cm. in diameter. Emaciation much more marked since last note. Hæmic murmur increased in intensity. Hæmoglobin, 45 per cent. No epistaxis since November 17, 1903, yet a gradual hæmoglobin reduction. No ascites. Has had dyspeptic symptoms, perhaps partly due to the excessive amount of food he has been taking.

March 12th. Patient began to complain of dyspnœa and fever, with great weakness. Temperature, 101°. Limit of cardiac dulness considerably to right of sternum; left border not definable, owing to interference of spleen; apex beat feeble and in third interspace. Same hæmic murmur. No recognizable increase in spleen and liver.

13*th*. Patient feeling better. Temperature, 100°; two ecchymotic (fresh) spots over right tibia; another on dorsum of left foot. Dyspnœa; respirations, 34. Says he feels comfortable.

20*th*. Since last note normal temperature until yesterday. To-day increased difficulty in breathing, pain behind sternum, sticking and rubbing in character; chills; respiration 38 and labored; pulse 116; temperature 103°. Apex beat cannot be felt; to-and-fro superficial friction at junction of third right rib with sternum. Diagnosis of pericarditis, with probable bloody effusion. From this day on fever persisted, weakness became extreme, the patient became irritable, objected to further blood examinations. Signs of fluid in peritoneal cavity. Dyspnœa more extreme, the pericardial friction more rough and superficial, the pulse became weaker; exitus, with mental faculties preserved to final moment, on March 30, 1904.

Negative Symptoms. Urine never contained bile; negative examination for pathological urobilin (Jaffé); never any casts; never albumin; urea never much above normal limits; highest 3.4 per cent. Ascites never present, except two days before death. Œdema absent. Jaundice absent throughout. Superficial lymph nodes never enlarged.

Blood. Never contained bile; coagulation time gradually increased in length toward terminal stage of disease to fourteen minutes, first examination in 1899 being three minutes.

Hemorrhages. Epistaxis was the only form. The attack of colitis associated with bloody stools cannot be considered as a melæna. Toward the last two years of life petechiæ and ecchymosis, few, however, in number.

Discoloration of Skin. Limited to face and neck, wrist and hands. Skin of body not discolored. Discoloration not that of Addison's disease; color, yellowish-brown. It would appear as if the light and air had some influence in changing the tint of the exposed parts. The color is not one due to ordinary exposure; it remained permanent. Bovaird mentions bronzing of the face and hands of his patient. Bronzing is not applicable to this case.

Local pain over spleen and liver absent, though such could be elicited by pressure.

No bone tenderness; pressure over lower end of femur and tibia relieved the pain when present in those regions.

No feeling of being sick except during an intercurrent affection—colitis, malarial disease, terminal pericarditis—on the contrary, a feeling of well-being.

Owing to the unusual importance of this case, I have been happy to call into its collaboration the aid of Dr. Mandlebaum, who made the histological examination and who prepared the photomicrographs, and of Dr. Libman, who made the autopsy.

REPORT ON POST-MORTEM EXAMINATION MADE MARCH 31, 1904, 11.45 P.M.—No rigor mortis; body emaciated; pupils large; yellowish-brown discoloration of face and hands. A few small lymph nodes in both axillæ the size of peas; in supraclavicular regions a few half the size; the same in the epitrochlear and inguinal regions. Panniculus adiposus atrophic; muscles of the abdominal wall succulent. In the abdomen 1000 c.c. of hemorrhagic fluid, chocolate in color. The body musculature is atrophic, pale.

Old and recent adhesions over liver; omentum adherent to anterior surface of the spleen; the spleen at its upper pole is adherent to the surrounding tissues.

Diaphragm on the right side at the third rib and on the left at the fourth rib. Lower part of the chest markedly expanded. All the intra-abdominal veins are distended.

Anterior mediastinal nodes enlarged the size of peas, yellowish-brown in color; on section there are pinpoint hemorrhagic areas.

Lungs. No fluid in pleural sacs; both lungs congested, lower lobes compressed. Lingula emphysematous. Bronchial nodes moderately enlarged and anthracotic.

Pericardium. Very markedly distended by 2 litres of very bloody fluid. Microscopic examination of the fluid reveals altered erythrocytes only. The visceral pericardium is coated by a layer of shaggy fibrin, which is easily removed.

Heart. Small; old thickening of posterior visceral pericardium; right auricle dilated. Tricuspid orifice admits three fingers; the valve is slightly thickened. The wall of the right ventricle is thin. The pulmonary valves are negative. The left ventricle is small; the auricle dilated. The heart muscle is firm, brownish. The coronaries and aorta show no lesions. There are no congenital defects.

Œsophagus and Stomach. Marked congestion. Stomach is dilated.

Spleen. Immensely enlarged, filling the larger part of the abdominal cavity. The weight is 5280 g. (11 pounds). It measures 40 x 20 x 14 cm. The organ is of an elongated ovoid form. The surface as a whole is of a reddish-brown color and shows marked recent and old perisplenitis. There are irregular depressed areas on the surface, evidently the result of infarctions. The organ is very firm. On section the color is that of chocolate, but here and there are lighter areas of a grayish-red color. The pulp is moderately swollen. There is a large number of old and recent infarctions, mostly peripheral. In some sections the whole periphery is made up of infarcted tissue; some of these infarcts are surrounded by hemorrhagic zones; most are anæmic and look cheesy. In the lower pole there is a white area about 1.5 cm. wide, crossing the entire width of the spleen. Where the pulp is less swollen the connective tissue is seen to be decidedly increased. In the pulp are a number of small hemorrhages. The splenic vessels show no changes. At the lower part there is a globular mass of splenic tissue attached by a flat pedicle to the main organ; it measures 4 x 6 cm. On section it is dark brown in color, with grayish markings.

Liver. Weight 4.8 k. (10 pounds). It measures 35 cm. in width; both lobes are 27 cm. in length; thickness of the organ is 13 cm. There is marked old and recent perihepatitis. The surface is pale reddish-brown, with irregular white and dark-brown markings. The right lobe is oblong; the left ovoid; the free border is rounded. On section the organ is quite firm. As a whole it is chocolate-colored; the cut surface is rather granular. Throughout the liver are irregular white markings, varying in diameter from 0.5 cm. to 2 or 3 cm., which, for the most part, are ramifying. They do not seem to bear any definite relation to the lobular markings. In both lobes, but especially in the right, there is a number of fine hemorrhages. The portal vein and the gall-ducts show no changes. The gall-bladder is distended by a large amount of very dark bile. The wall appears to be normal.

Kidneys. Left: weight, 150 g., capsule markedly adherent; moderate lobulation; surface slightly granular; veins injected. On section the organ is quite firm. The cortex is narrow, but swollen; the markings are poor. There is a hemorrhagic area in the labyrinth. There are uric acid deposits in the cortex and in the papillæ; also lime infarctions in the latter. In the pelvis there are petechiæ and one large hemorrhage. Right: weight, 120 g.; surface the same as that of the left kidney; cortex, yellow in color. The organ is succulent; there are hemorrhages in the pelvis. Just external to the pelvis there is a border of very succulent, reddish tissue, varying in width from 0.5 cm. to 1 cm. There are uric acid and lime deposits as in the left kidney.

Ureters. Negative.

Adrenals. Negative.

Pancreas. Negative.

Small Intestine. The walls of the jejunum and duodenum show blood injection; the contents are tarry. The mucosa of the ileum is swollen, and there are hemorrhages in the wall.

Colon. Small effusion of blood in and under the mucosa of the ileocæcal valve and the cæcum. The contents of the large intestine are hemorrhagic. No evidences of lymphatic hyperplasia. The wall of the rectum is injected.

Bladder. Marked injection of the vessels of the trigone. Prostate normal in size; color, yellowish.

Lymph Nodes. The mesenteric nodes moderately enlarged; they look like the prevertebral nodes. The latter vary in size, the largest being about the size of a large bean. They are fairly soft, ochre in color, and show some hemorrhagic markings.

Bone-marrow of Femur. Uniformly dark red in color; quite firm; no changes in bone.

Thoracic duct is formed by two separate channels, which coalesce just below the diaphragm.

Bacteriological Examination. Cultures made from the heart blood remain sterile. Those made from the spleen show the staphylococcus albus.

MICROSCOPIC FINDINGS. Pieces of tissue from various parts of the organs were fixed in Zenker's solution, saturated sublimate, formalin, alcohol, Müller's fluid, and Orth's solution, and were embedded both in celloidin and paraffin. The ordinary histological stains were employed, also iron hæmatoxylin, Biondi-Heidenhain, Pappenheim's methyl-green pyronin, Mallory's connective-tissue stain, Unna's polychrome methylene blue, Weigert's modified Van Gieson's stain, and others.

Spleen. Certain peculiarities are found in sections from different parts of the organ. Many dense bands of fibrous connective tissue are seen surrounding certain parts of the splenic tissue. In places where these bands are less dense, the individual connective-tissue fibres are seen to be slightly separated from one another by a faintly staining homogeneous substance containing a few mononuclear cells and giving the usual appearances of œdema. Occasionally an area is found near the margin of a band of connective tissue, where the fibres are more widely separated, giving rise to small, irregularly shaped spaces or meshes. As a rule, these spaces contain a few normal pulp cells, though here and there an endothelial cell of the type described below is seen, entirely surrounded by delicate connective-tissue fibres. The capsule and the trabecular arrangement are quite normal, with the exception of certain pigment, which will be mentioned below, and a slight increase in the amount of connective tissue. The infarcts are of the usual anæmic variety. Some of these contain areas of necrosis, with many slit-like openings, due, in all probability, to the presence of cholesterin crystals. In some of the necrotic areas the remnants of alveolar spaces filled with endothelial cells, as described below, can be seen.

Scattered throughout all the sections are large masses of cells which require further description and which seem to be the principal and characteristic feature of the disease. The cells are found mainly in large, irregularly shaped, alveolar spaces, whose walls are composed of delicate connective tissue lined by endothelium. Fine capillaries are seen in the walls in places where the latter are somewhat thickened. These alveolar spaces measure from 130μ by 269μ to 95μ by 108μ, respectively. Many variations in size occur between these extremes. The alveolar spaces or pulp spaces may be looked upon, according to Weidenreich,[11] as the venous capillaries of the spleen. In some places a direct connection between adjacent alveoli is found to exist.

The endothelial cells which line these spaces can readily be seen. In some places they are of normal appearance; in other places they are distinctly swollen. Occasionally a few very delicate connective-tissue fibres may be found within the alveoli. The endothelial cells filling these spaces are so abundant in number that in many places it is impossible to distinguish any of the normal splenic tissue. Only here and there can a single Malpighian body be seen. These bodies have no degenerative changes, but the central artery shows a slight thickening of its walls. Here and there a few connective-tissue fibres can be found in the Malpighian bodies themselves, principally at the periphery. The cells are found both lying free and attached to the wall of the spaces, and their size and shape corresponds to the amount of pressure exerted upon them. For the most part, the cells resemble swollen endothelial cells. They are, as a rule, quite large in size, round, oval, or polygonal in shape, depending upon the number in a given space (Fig. 1). The cell bodies stain faintly, but distinctly with eosin or picric acid, and show a slightly granular appearance of the cytoplasm, but no degenerative changes. The outline of the cell body is usually well preserved. In thin paraffin sections a distinct network of fine linear markings can be seen in some of the cells; with the high power these fine lines seem to be composed of minute dots. In other cells very delicate wavy lines are distinguished, arranged in a more or less concentric form, giving a streaked or wrinkled appearance to the cell. This appearance of the cytoplasm is well brought out by Mallory's phosphomolybdic acid hæmatoxylin stain. Fig. 2 shows the general granular and streaked appearance of the cells under high amplification. Vacuoles are not uncommon, as many as four or five being present in some of the larger cells. In favorable parts of the sections the cells can be seen arising directly from the endothelial lining of the pulp spaces, or, more properly, venous capillaries. In size the cells vary from 17.4μ by 21.75μ, to 34.8μ by 47.85μ, respectively. Nuclei of a relatively small size are seen in the cells. The average measurement is 5.43μ by 8.7μ. These are found either centrally placed or near the periphery. Some of the cells contain three or four nuclei, but the number of nuclei found in a single cell does not correspond always to the size of the latter, for some of the very largest cells contain but a single nucleus. The nuclei vary considerably in size, from small, round, deeply staining bodies rich in chromatin, to larger, irregular forms staining rather freely. Some of the nuclei show atypical mitotic changes, and a few contain distinct nucleoli. No typical giant cells are seen in any of the sections. Here and there the pulp spaces are seen well distended with red blood cells and normal adenoid tissues. Some of these spaces contain but a few endothelial cells; others show a relatively large number. Many of the bloodvessels throughout the sections are surrounded by a slight increase of connective tissue. A few veins, however, are noted, whose walls appear quite normal. These are filled with blood.

Light, brownish-colored pigment particles are scattered here and there in the pulp spaces and also in some of the pulp cells. Throughout the trabeculæ fine granules of brownish-yellow pigment are seen, in long spindle-form arrangement, corresponding to the capillaries and also lying free between the connective-tissue fibres. Sections treated with potassium ferrocyanide and hydrochloric acid give the characteristic iron reaction. Sections were stained for bacteria, but none could be discovered. Neither could any bodies be found resembling protozoa.

Liver. The capsule is much thickened and contains many pigment granules. A striking feature in all the sections is the enormous increase in the amount of interlobular connective tissue throughout the organ, without any apparent influence upon the liver cells themselves. This interlobular structure is composed of very delicate connective-tissue fibres containing numerous capillaries and some pigment. With Mallory's aniline-blue stain a few very fine fibrillæ can be seen extending into the lobules here and there. The bile-ducts are not increased in number and appear quite normal. Under the low power the general picture is that of a diffuse hepatic cirrhosis (Fig. 3). The liver cells, for the most part, are normal, though occasionally a cell is seen containing minute fat-droplets, and a few nuclei show the usual appearance of regeneration.

The peculiar endothelial cells described in the spleen are also found in abundance in this organ. A few are seen in the lobule proper, but the majority are situated in interlobular connective-tissue spaces. In the lobules these cells are, for the most part, situated in the capillaries at the periphery, though now and then single cells can be found in the deeper parts of the lobule surrounded by liver cells. The individual endothelial cells can be made out quite readily, though they are not so clearly defined as in the spleen. In the interlobular connective-tissue spaces the cells are so intimately fused together that their recognition is somewhat more difficult, but sections treated by Weigert's modified Van Gieson's stain show the cell bodies quite distinctly. In every other respect the cells are identical in appearance with those found in the spleen. In a few places there seems to be a tendency for these cells to invade the lobule itself, but, for the most part, the cells seem to be confined to these spaces and in intimate union with the connective-tissue fibres. The pigment in this organ responds also to the test for hæmosiderin. The bloodvessels appear quite normal, as a rule. Some of the arteries have slightly thickened walls.

Mesenteric Lymph Nodes. The capsule and trabeculæ are sharply defined by the large amount of pigment which outlines their course. Throughout the nodes the trabeculæ are deeply pigmented, but not otherwise affected (Fig. 4). The pigment is dark brown in color, and in the thinnest sections can be seen either as elongated whetstone-shaped crystals or as fine amorphous particles. Smaller masses of pigment are also seen distributed in the cortical and medullary portions of the node. The lymph sinuses are all filled with pigment. Iron reaction is present. The nodes are so changed in general appearance and structure that the usual characteristics have entirely disappeared. A section through the central portion of a somewhat enlarged node shows less than ten follicles. The germinal centres are not well marked, but otherwise the follicles are quite normal, excepting that occasionally a few delicate connective-tissue fibres may be seen in the follicle near its periphery. Only here and there are small remnants of normal lymphoid tissue seen (Fig. 5). The medullary portion of the node is somewhat less affected than the cortical substance. The reticulum of the organ is well preserved.

The entire node is practically transformed by the presence of endothelial cells, such as were described in the spleen and liver. With the exception of the connective-tissue structures, follicles, and small remnants of lymphoid tissue, the whole section is but one mass of these cells. Notwithstanding this fact, the individual cells are most distinctly outlined and clearly seen and show but a slight tendency to fuse together. The cells can be seen arising from the walls of the lymph sinuses (Fig. 6), and from the reticulum throughout the node (Fig. 7). In size, shape, structure, and staining properties, the cells are identical with those described above. A few very large cells measuring 39.15μ by 56.55μ, are present. Some contain as many as nine nuclei. These are not arranged in any particular form, and no cells are found presenting any of the usual appearances of giant cells. The bloodvessels are surrounded by a slightly increased amount of connective tissue, but show no other changes.

Bronchial Lymph Nodes. These nodes are affected in a like manner. The endothelial cells are of the same general structure and appearance as in the mesenteric lymph nodes and distributed in a similar manner, but they are not present in such great numbers. Here and there small areas of quite normal adenoid tissue are seen, with fairly well-preserved follicles. Pigment is also present and is identical in color, distribution, and reaction with that found in the mesenteric nodes. Besides this, a moderate amount of anthracosis is present. The capsule and trabeculæ show a rather marked increase in amount of connective tissue. The bloodvessels are prominent throughout and well distended with blood. Their walls are somewhat thickened, but show no degenerative changes.

Retroperitoneal Lymph Nodes. The same process is also found here. The general picture is identical, but a few slight differences may be noted. The capsule is more markedly thickened than in the other nodes, but the pigment, particularly in the lymph sinuses, is not as prominent. Surrounding the follicles are quite a number of small capillaries, and the margins of the follicles show the presence of young connective-tissue fibres. Numerous small bloodvessels, mostly arteries, are seen. These vessels show hyaline changes. In parts of the section degenerative processes have occurred, so that many of the endothelial cells, as well as the adenoid tissue, do not stain distinctly. The entire process in these nodes seems somewhat older than in those described above.

Bone-marrow. Cells identical with those in the above-described organs are found in abundance in the bone-marrow. There is considerable variation in the size of the cells in the bone-marrow as compared with those found in the other organs, but the general characteristics are preserved. Vacuoles are common in these cells. No forms are found with an excessive number of nuclei, neither are any of the very large types, such as were described in the lymph nodes, to be seen. Occasionally a large mass of these cells is noted, but for the greater part they are found either singly or in groups of from four to ten cells (Fig. 8). In the latter instance the cells are always found in intimate relationship with the walls of the capillaries or attached to the connective-tissue reticulum. The larger masses cannot always be seen to have such a relationship, and occasionally they are found surrounded by a considerable number of red blood cells. In a few places the cells are distinctly seen within the lumen of dilated capillaries.

A large number of stains were employed in the examination of these sections, but the Biondi-Heidenhain method gave the best results, bringing out the connective-tissue reticulum with much clearness. A few polynuclear leukocytes, some of which show eosinophile granulations, are present, also normoblasts and giant cells in considerable numbers. The larger bloodvessels appear normal. No pigment is present.

Spreads made from the bone-marrow by Dr. Libman, and stained with eosin-hæmatoxylin, Ehrlich's triacid stain, Jenner's stain, and Wright's stain, show the following: There are present many erythrocytes; these are of about the normal size or larger (macrocytes). Slight poikilocytosis is also noted. Normoblasts are very abundant, showing karyokinetic and karyolytic changes. Small and large lymphocytes and mononuclears are present; also polynuclear neutrophilic and eosinophilic leukocytes, but the main bulk of leukocytes is made up by neutrophilic and eosinophilic myelocytes. Some of these are quite large, as are also some of the polynuclear leukocytes. With the Wright stain azurophile granules are seen in a few lymphocytes. Mastzellen are not to be found. The large endothelial cells have basophilic nuclei; their cytoplasm stains slightly basophilic and faintly acidophilic. Giant cells are abundant.

The spreads of the spleen and liver show no nucleated erythrocytes, no giant cells of the type seen in the marrow, and no myelocytes. The cytoplasm of a few of the endothelial cells is granularlooking, the granules taking on an appearance resembling neutrophilic granulations, but they do not impress one as possessing true granulations.

Lung. The vessels are all distended with blood. The vesicles are compressed in a great measure and show evidences of œdema. A moderate amount of fibroid induration is present. The sections show a moderate degree of anthracosis, and some hæmatogenous pigment is seen scattered through the organ.

Heart. The pericardium shows a recent serofibrinous exudate with the production of young connective-tissue fibres. In the meshes of this exudate are a large number of small round cells and some red blood cells. Many newly-formed capillaries are also noted. The muscle fibres of the heart show considerable parenchymatous degeneration; also a moderate amount of brown atrophy. No changes are seen in the bloodvessels.

Kidney. Sections show the usual picture of a chronic interstitial nephritis. Bowman's capsule is much thickened, and here and there the glomeruli are entirely replaced by fibrous tissue. The tubular epithelium is coarsely granular, and the nuclei are occasionally missing. The epithelium shows vacuoles in places. There is also some increase in connective tissue between the tubules, and a few areas of infiltration by small round cells are seen. The vessels are the seat of endarteritis, and the sections also show a slight amount of congestion. Small deposits of lime salts are present. The right kidney shows rather more congestion than the left, and in the medulla is a large hemorrhagic area containing blood pigment and surrounded by a zone of chronic inflammatory tissue.

Pancreas. This organ shows no lesion.

Adrenal. The sections are normal.

Colon. The mucosa is somewhat congested. In the submucosa are many dilated veins filled with blood. Otherwise the sections are quite normal.

While the study of this case was nearing completion, the sister of this patient met with a fatal accident. Her organs are now being studied. Owing to the fact that these may give additional information, we shall reserve our full discussion of the features of these cases to a subsequent publication.

We may state, however, that our findings enable us to place this case in the group described by Gaucher, Picou and Raymond, Collier, and Bovaird. The spleen and liver show the same changes as described by Gaucher, but he has not reported fully in regard to the lymph nodes. Picou and Raymond report simply on the spleen and lymph nodes, as in their case the spleen was removed at operation. Our findings correspond with theirs in nearly every respect. The spleen in Collier's case is also identical. Bovaird's case and ours are also similar, but our case is the first one in which the bone-marrow was examined and the endothelial hyperplasia discovered.

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SUCTORIAL AND OTHER INSECTS AS PLAGUE CARRIERS.

A NEW SPECIES OF RAT FLEA.

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AMONG over twenty fatal plague cases investigated by the writer there was one in which it strongly appeared that the infecting bacilli had been carried into the body of the patient—a child—by *pediculi capitis*. It is stated advisedly that this mode of infection appeared very probable, because it is naturally impossible to be certain beyond doubt as to such an occurrence. Only experimental trials on human beings could firmly establish the possibility of this mode of transmittal; but such tests with plague bacilli are of course, inadmissible.

The question whether insects, and particularly parasitic ones, play a more or less important role in the spreading of plague is still far from being settled definitely, as the views of investigators and writers upon this subject are much divided. Among the modern workers on plague who first gave their attention to insects as plague carriers is Hankin,[1] who reports that he carried out a long series of researches on the relation of rat-cadaver-eating ants to the possible spread of plague. He found that ants neither die of plague nor retain the infection for any time. By making extracts of ants shortly after they had eaten from rats dead of plague, Hankin obtained a material which, when injected into rats and mice, would kill them, producing typical plague lesions in them.

Ogata,[2] in studying a plague epidemic in Formosa, took seven fleas from a rat dead of plague, crushed them between sterile slides,